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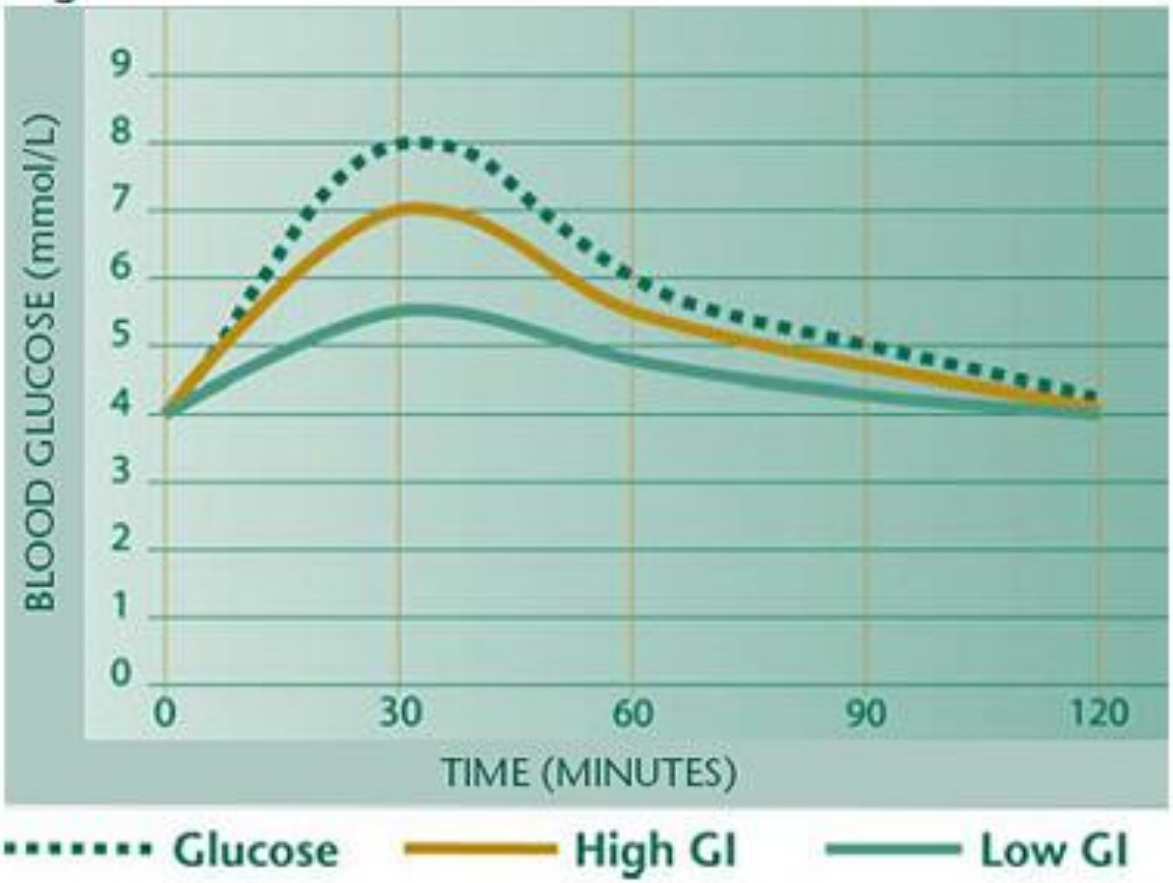
The Glycemic Index Controversy

Definitions

- Glycemic Index (GI): measures the impact a food has on your blood glucose levels compared to glucose or white bread. (1)
- Glycemic Load (GL): total grams of carbohydrate in a serving size by the GI/100.
  - accounts for the quality and quantity of carbohydrates (2)

Area Under the Curve (AUC)

Figure 1.



Misconceptions

- GI measures height of glucose response **not** speed (1,3)
- Simple vs complex carbohydrates: **no** difference in the speed of glucose response. (1)

History

- Otto, 1973: came up with the GI concept (4, 5)
- Jenkins and et al, 1981: conceived the GI

Jenkins' Study

- Subjects: 34 healthy, nondiabetic
- Design: Fed 62 different foods to subjects and test glucose levels
- Results: dairy products, legumes, and fruits had the lowest glucose response
  - breads, breakfast cereals, and rice, including whole grain, had both high and low GI. (6)

Atkinson's Study

- Atkinson and et al., 2008
  - Design: meta-analysis from 205 articles
  - Results: created tables that not only supported Jenkins' work but added ~2,418 more foods. (2)

GI Limitations

- Diabetes vs. Healthy Subjects
- Laine and et al.
  - Subjects: healthy and diabetic
  - Design: fed high, medium, and low GI meals
  - Results: diabetic subjects had the highest glucose response with moderate foods, and lowest with low foods
    - Healthy subjects had the highest response with high foods and lowest with low foods (7)

GI Limitations

- Mixed diet
  - Fiber: high-fiber diets (50-g) show a positive effect on glycemia (1, 8)
  - Fat: replacing high-carbohydrate with high-monosaturated makes a difference (1)
  - Protein: increases weight loss by reducing appetite and increasing satiety (1, 8)
    - Weight loss may increase glyemic control (9)

GI Limitations

- Mixed meals
  - Flint and et al.
    - Subjects: 28 healthy-male subjects
    - Design: consumed 13 breakfast meals and a reference meal
      - Contained different amounts of protein, fat, and energy content.
    - Results: mixed meals are poorly correlated with predicted GI responses. (10)

GI Limitations

- Physical form
- O’ Dea and et al.
  - Subjects: 6 males
  - Design: fed four different forms of rice to subjects
  - Results: ground rice produced a greater glycemic response (11)

GI Limitations

- Processing/preparation
  - Aguilera and et al.
  - Design: chickpea and lentil after soaking, cooking, and industrial dehydration
  - Results: cooking the chickpea and lentil after soaking greatly increased available starch content (12)

GI Limitations

- Ripeness
  - Englyst and Cummings
  - Subjects: 3 subjects with ileostomies
  - Design: fed six bananas with varying levels of ripeness
  - Results: starch content was absorbed more with less ripe bananas (13)

GI Limitations

- Within Person Variability
  - Venn and Green recommend subjects should be tested 2 to 3 times. (14)

Effectiveness in Practice

- Brand-Miller and et al.
  - Subjects: 356
  - Design: meta-analysis of 14 studies; short-term studies
  - Results: 0.43% reduction in HGB $_{A1C}$ with low-GI diet (15)

Effectiveness in Practice

- Wolver and et al.
  - Subjects: 162, T2DM
  - Design: assigned subjects low GI diet + low CHO, high GI diet + high CHO, or low GI diet + high-monosaturated fat diet for 1 yr.
  - Results: no difference in HGB_{A1C} (17)
  - May be difficult to follow a low-GI diet (18)

Benefits of GI

- Brand-Miller and et al. claim increased satiety with low-GI foods
- Holt and et al.
  - Subjects: ~66
  - Design: fed 38 different foods
  - Results: higher satiety among CHO-rich foods. (14)

Current Usage

- Food and Agriculture Organization (FAO)
- World Health Organization (WHO)
  - Encourage high-carbohydrate diets of 56% of mainly nonstarch polysaccharides and low GI
- Australia's official dietary guidelines for healthy elderly people
  - Recommend low GI cereal to promote good health and want GI listed on food label (4, 19)

Recommendations

- Academy of Nutrition and Dietetics
  - should inform clients about conflicting results (20)
- American Diabetes Association
  - modest benefit if total carbohydrates are consumed in isolation.
  - Best diet strategy for glucose control is monitoring CHO (8)

Summary

- GI has limitations: diabetics may have difference response, mixed meals, physical form, processing/preparation, ripeness, and within person variability
- short-term benefits but no sufficient evidence supports the long-term
- Monitoring CHO is the best way to go

Lessons from Research

- Research is difficult and time consuming
- Answers are rarely clear cut

Any questions?

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